

Accuracy Characteristics for Final Delivery Scenario Hours 1100-1600 Single Site

1 Introduction

This document contains scenario characteristics for hours 1100 to 1600 GMT recorded on May 26, 1999 at Memphis ARTCC and cover either the ZME or ZID airspace. Characteristics to be provided are general statistics determined from the scenario on airspace characteristics, aircraft to aircraft and aircraft to airspace encounters, general air traffic, aircraft, flight plan adherence, interfacility traffic flow and deviations in weather forecasts. Definitions of the provided scenario characteristics are provided in Reference[1].

2 Reference

[1] Paglione, M., Oaks, R., Ryan, Dr. H., Summerill, J.S., (Final, January 2000), *Description of Accuracy Scenarios for the Acceptance Testing of the User Request Evaluation Tool (URET) / Core Capability Limited Deployment (CCLD)*, FAA William J. Hughes Technical Center / ACT-250, Atlantic City, New Jersey.

NOTE – Section numbers in this document do not map to those of the reference document.

3 Center Airspace

This section corresponds to Section 3.1 of Reference[1]. The below data corresponds to the ZME Center using the May 20, 1999 ACES chart cycle. Information gathered from running URET PRE, accessing the ZME Center Internet site and local knowledge.

Metric	Definitions	Count
Center Area	Approximate Square Miles	120000
Airports	From URET DU Adaptation List	778
Sectors	From URET DU Adaptation List	110
SAA	Special Activities Airspace	57
APDIA	Automated Problem Detection Inhibited Area	20
SID	Standard Instrument Departure	11
STAR	Standard Arrival Route	10
PAR	Preferential Arrival Route	594
PDR	Preferential Departure Route	346
PDAR	Preferential Departure Arrival Route	124

4 Aircraft Encounter Distributions

The statistics collected in this section characterize aircraft to aircraft encounters. The encounter counts are partitioned by selected minimum horizontal separation intervals, a count of encounters partitioned by standard flight levels, and by vertical phase of flight and aircraft encounter angle. This section corresponds to Section 3.2.1 in Reference[1].

4.1 Count Partitioned by Minimum Horizontal Separation

This section corresponds to Section 3.2.1.1 in Reference[1].

Table 1: Count of Current Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	13 Minutes Adherence
$0 \leq d < 5$	134	89
$5 \leq d < 10$	170	106
$10 \leq d < 15$	215	133
$15 \leq d < 23$	436	251
$23 \leq d < 30$	360	233
Total	1315	812

Table 2: Count of Trial Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
$0 \leq d < 5$	134	85
$5 \leq d < 10$	170	104
$10 \leq d < 15$	215	126
$15 \leq d < 24$	485	265
$24 \leq d < 30$	311	196
Total	1315	776

4.2 Count Partitioned by Altitude for Standard Separation Intervals

This section corresponds to Section 3.2.1.2 of Reference[1].

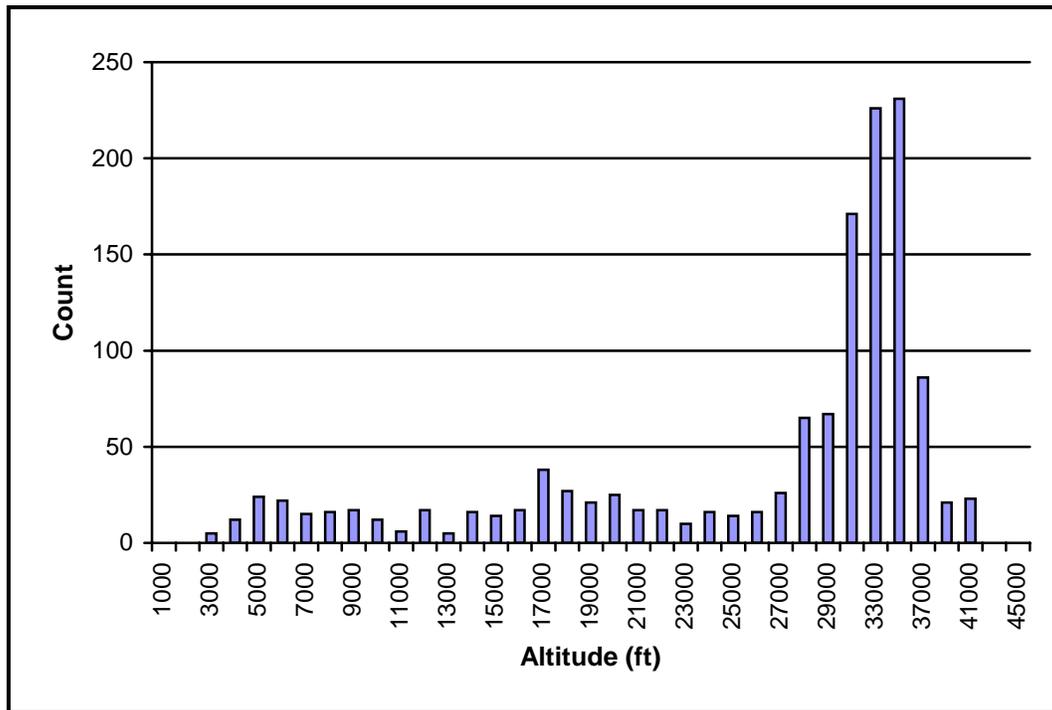


Figure 1: Aircraft to Aircraft Encounters by Altitude

4.3 Count Partitioned by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.1.3 of Reference[1].

Table 3: Count of Aircraft Encounters Partitioned by Phase of Flight and Encounter Angle

Vertical Phase	Encounter Angles (deg)				Total
	[0, 45)	[45, 90)	[90, 135)	[135, 180]	
Cruise-Cruise	119	115	51	19	304
Descend-Descend	36	6	4	7	53
Climb-Climb	26	4	3	4	37
Cruise-Climb	142	81	72	96	391
Cruise-Descend	148	83	74	100	405
Climb-Descend	31	17	21	43	112
Unknown	9	4	0	0	13
Total	511	310	225	269	1315

5 Airspace Encounter Distributions

This section provides statistics on aircraft to airspace encounters. Three areas considered are counts partitioned by selected minimum horizontal separation intervals, an encounter count partitioned by standard flight levels, and a count partitioned by vertical phase of flight and airspace encounter angle. Additionally, vertical phase of flight count is separated into top, bottom and side airspace encounters and for encounters with unknown encounter angles. The section corresponds to Section 3.2.2 of Reference[1].

5.1 Count Partitioned by Minimum Horizontal Separation

The section corresponds to Section 3.2.2.1 of Reference[1].

Table 4: Count of Current Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	13 minutes Adherence
Conflicts ¹	2208	1916
$d = 0^2$	30	25
$0 < d < 7$	788	635
$7 \leq d < 9$	222	172
$9 \leq d < 11$	175	143
$11 \leq d < 16$	513	399
$16 \leq d < 30$	1795	1413
Total	5731	4703

Table 5: Count of Trial Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
Conflicts ³	2208	1879
$d = 0^4$	30	25
$0 < d < 8$	907	717
$8 \leq d < 11$	278	213
$11 \leq d < 13$	175	129
$13 \leq d < 19$	713	561
$19 \leq d < 30$	1420	1093
Total	5731	4617

¹ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

² This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

³ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

⁴ This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

5.2 Count Partitioned by Altitude

This section corresponds to Section 3.2.2.2 of Reference[1].

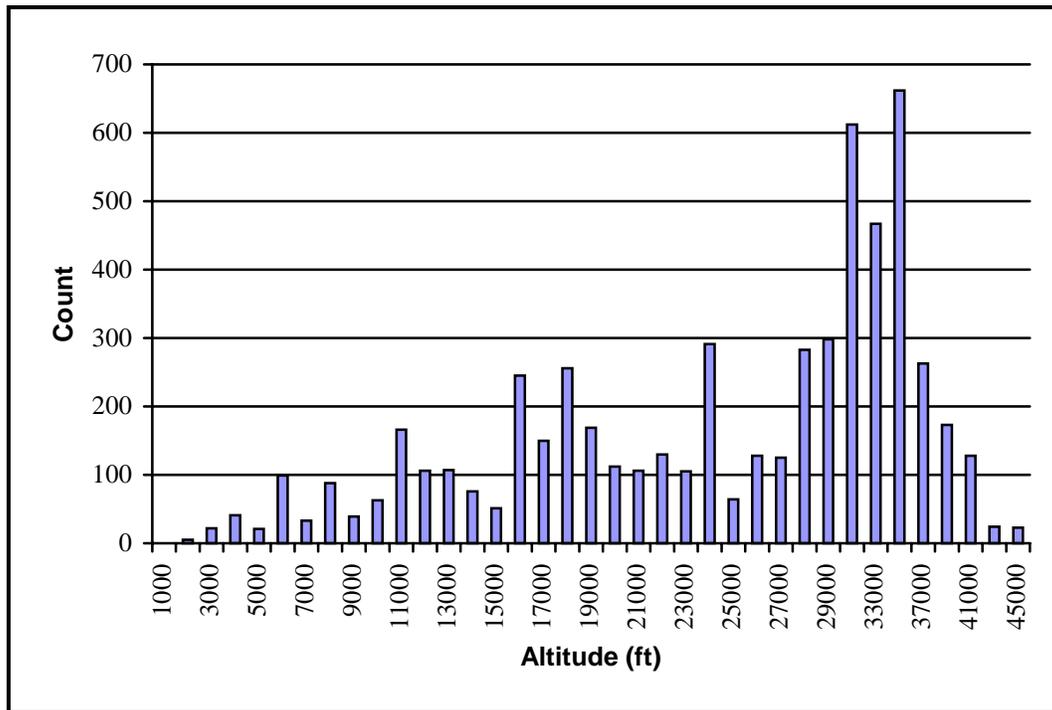


Figure 2: Airspace to Airspace Encounters by Altitude

5.3 Count by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.2.3 in Reference[1].

Table 6: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Side Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	18	71	105	194
Cruise	122	561	692	1375
Descend	22	57	65	144
Total	162	689	862	1713

Table 7: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Top and Bottom Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	176	0	0	176
Cruise	1	0	0	1
Descend	20	0	0	20
Total	197	0	0	197

Table 8: Count of Airspace Encounters by Vertical Phase of Flight with Unknown Angles

Vertical Phase	Count
Climb	59
Cruise	208
Descend	31
Total	298

6 Air Traffic Distributions

This section provides metrics that characterize the air traffic. The metrics are flight density partitioned by standard flight levels, flight type and sector penetration, statistics on the number of active flights, ground speed statistics, counts of interim altitude and amendment messages, and air traffic maneuvers by altitude and phase of flight. This section corresponds to Section 3.3 of Reference[1].

6.1 Air Traffic Density

This section corresponds to section 3.3.1 of Reference[1]. Detailed statistics on aircraft encounters are provided in Appendix A.

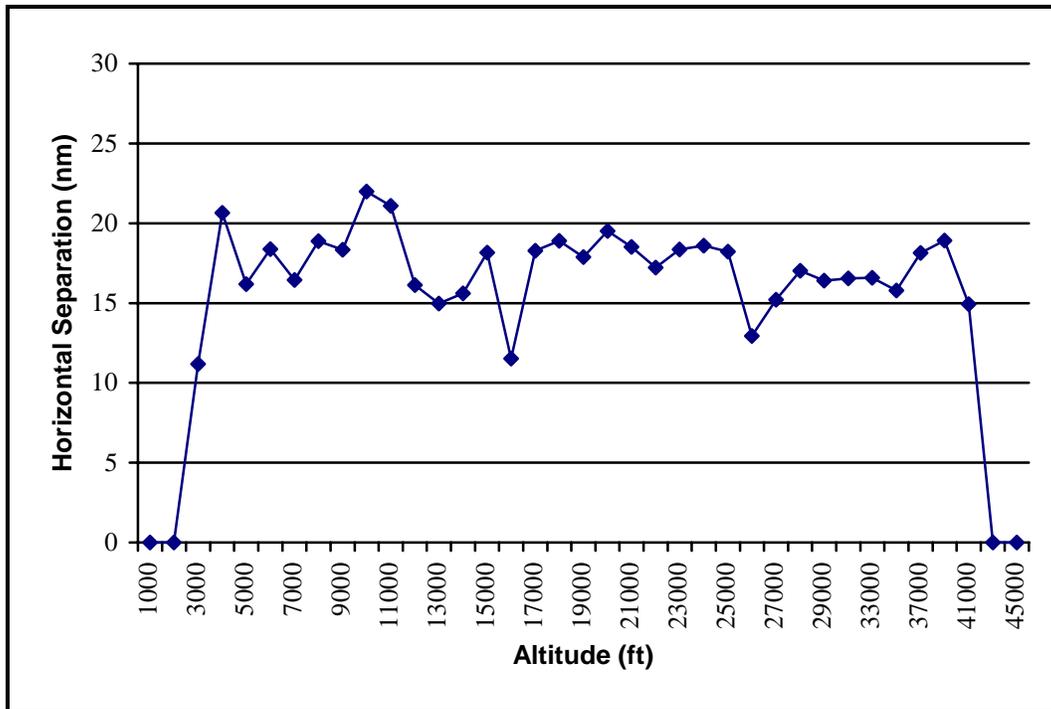


Figure 3: Average Horizontal Separation by Altitude for All Hours

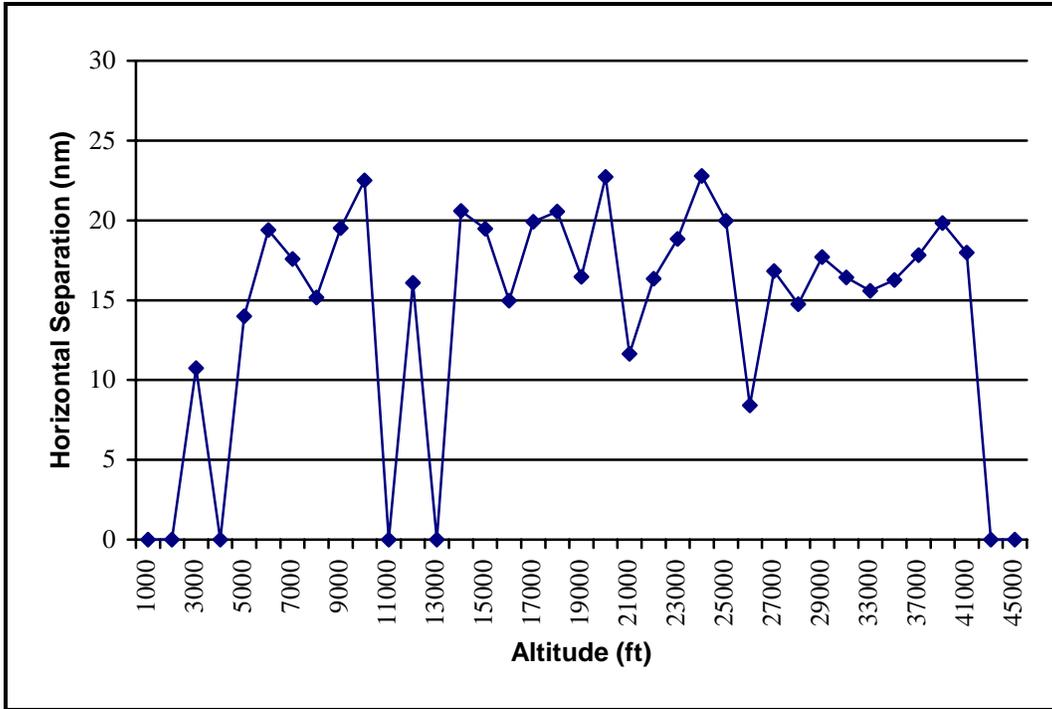


Figure 4: Average Horizontal Separation by Altitude for Hour 1

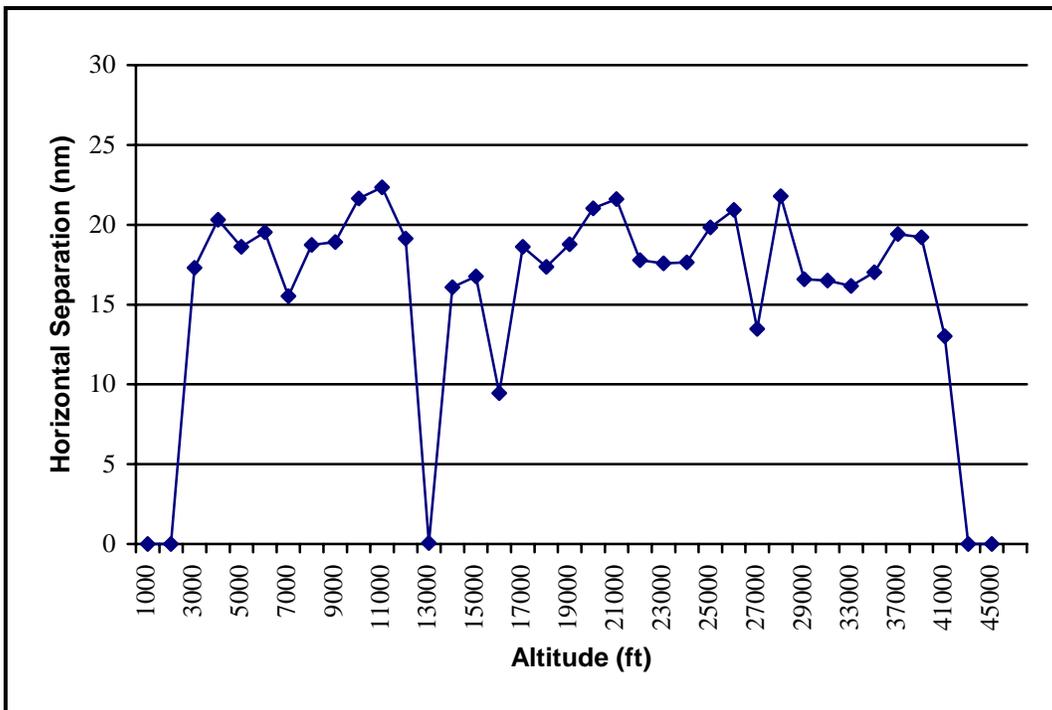


Figure 5: Average Horizontal Separation by Altitude for Hour 2

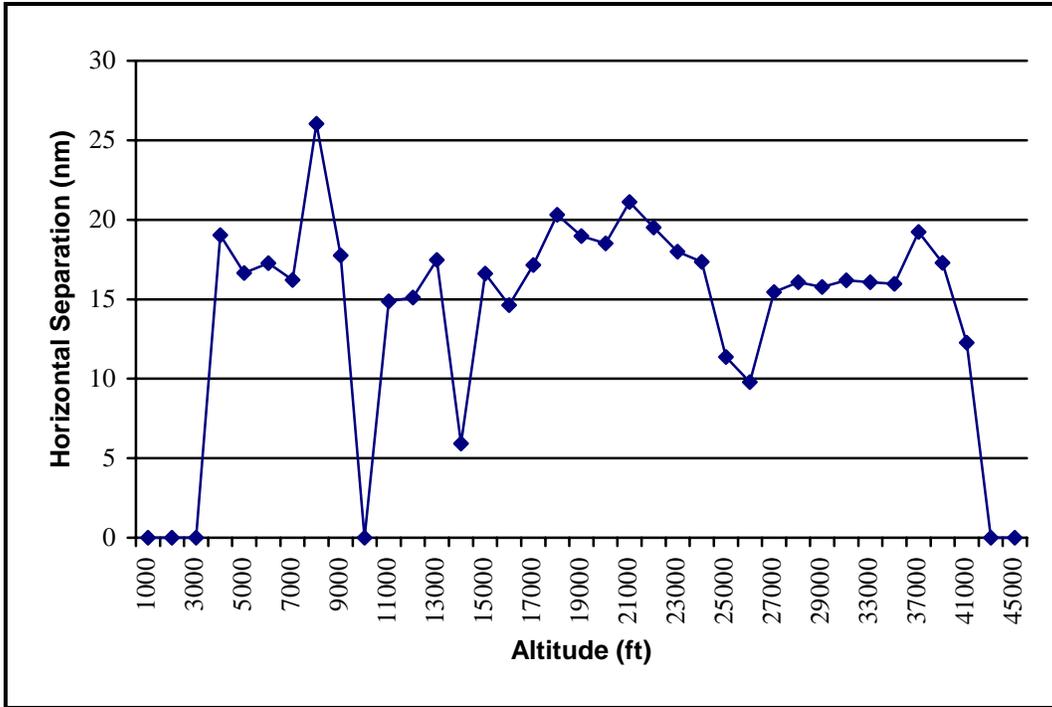


Figure 6: Average Horizontal Separation by Altitude for Hour 3

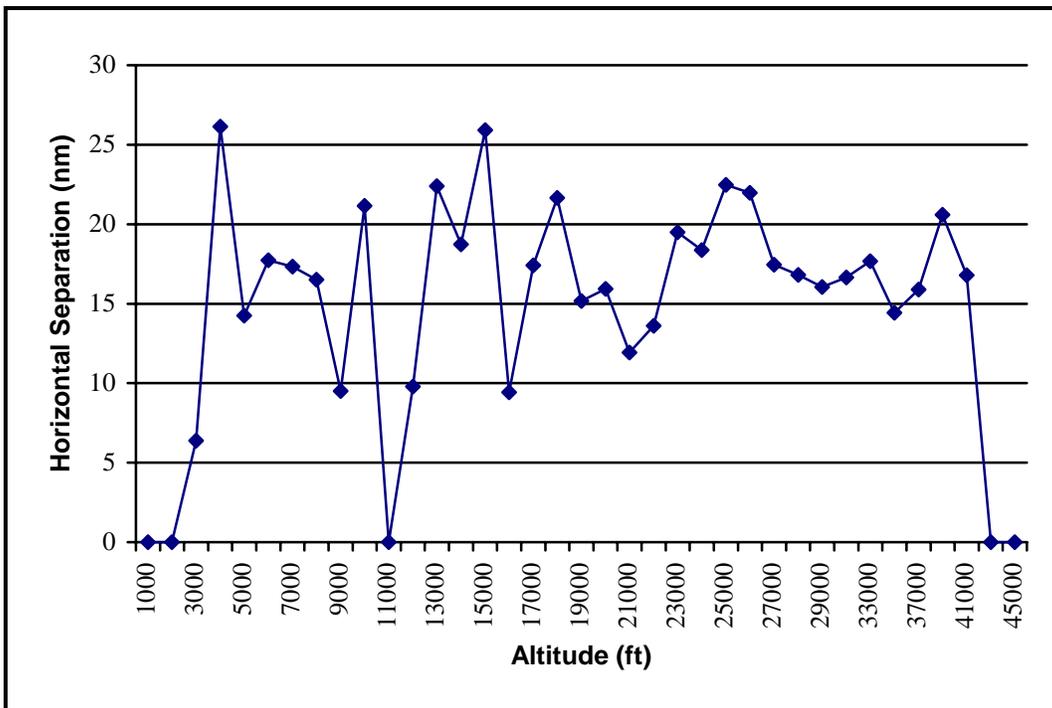


Figure 7: Average Horizontal Separation by Altitude for Hour 4

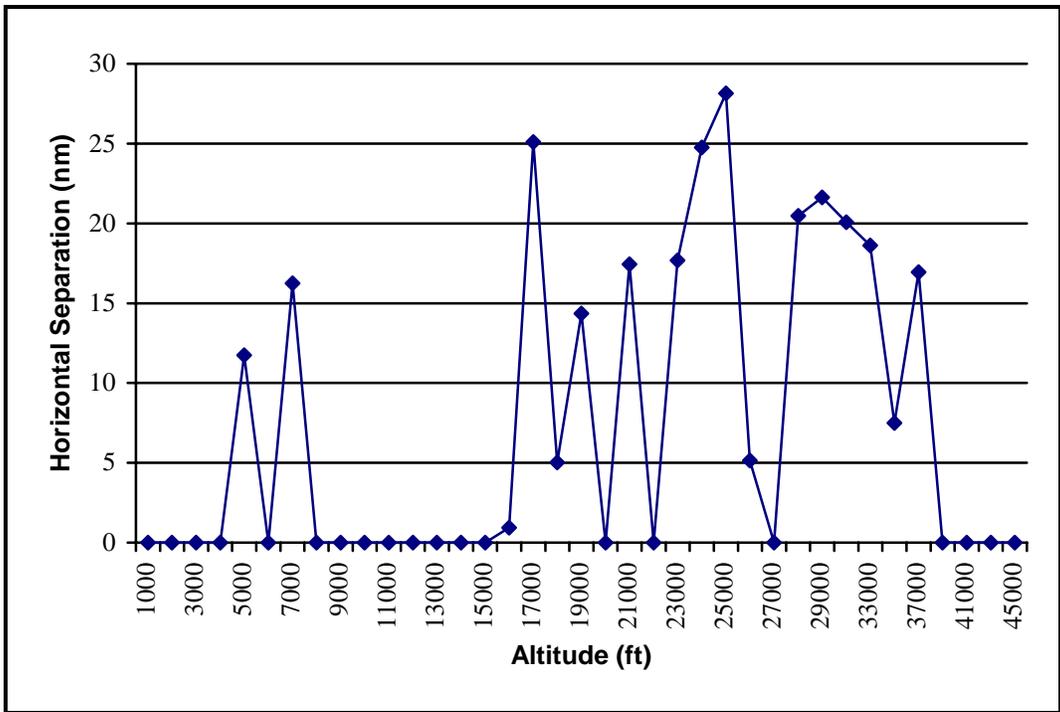


Figure 8: Average Horizontal Separation by Altitude for Hour 5

Appendix A: Supplement to Section 6.1 - Aircraft Traffic Density

Table 9: Statistics on Aircraft Encounters by Altitude Interval for All Hours

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	5	11.186	4.764
4000	12	20.646	7.359
5000	24	16.190	8.326
6000	22	18.387	7.759
7000	15	16.438	8.243
8000	16	18.878	5.647
9000	17	18.334	6.164
10000	12	21.989	5.041
11000	6	21.098	5.574
12000	17	16.131	8.920
13000	5	14.975	11.255
14000	16	15.615	8.577
15000	14	18.155	8.629
16000	17	11.524	8.356
17000	38	18.282	7.897
18000	27	18.898	7.555
19000	21	17.874	8.074
20000	25	19.505	7.144
21000	17	18.518	6.855
22000	17	17.226	7.761
23000	10	18.350	5.357
24000	16	18.597	6.708
25000	14	18.211	8.059
26000	16	12.943	8.359
27000	26	15.212	8.868
28000	65	17.029	7.957
29000	67	16.409	7.397
31000	171	16.542	7.956
33000	226	16.584	8.216
35000	231	15.790	8.187
37000	86	18.146	7.866
39000	21	18.919	7.389
41000	23	14.940	9.738
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	1315		

Table 10: Statistics on Aircraft Encounters by Altitude for Hour 1

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	3	10.748	3.851
4000	0	0.000	0.000
5000	3	13.995	2.042
6000	3	19.390	12.956
7000	2	17.581	13.170
8000	3	15.163	7.190
9000	7	19.506	7.833
10000	6	22.496	6.366
11000	0	0.000	0.000
12000	8	16.093	6.107
13000	0	0.000	0.000
14000	5	20.594	4.106
15000	4	19.484	7.409
16000	7	14.975	9.318
17000	7	19.917	8.792
18000	1	20.558	0.000
19000	2	16.475	13.328
20000	3	22.721	3.013
21000	1	11.640	0.000
22000	1	16.336	0.000
23000	2	18.834	5.087
24000	1	22.778	0.000
25000	2	19.966	3.979
26000	4	8.406	6.348
27000	4	16.831	8.240
28000	13	14.758	8.920
29000	9	17.692	8.825
31000	15	16.418	7.969
33000	32	15.580	8.864
35000	48	16.273	8.930
37000	12	17.811	7.491
39000	5	19.838	5.479
41000	1	17.977	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	214		

Table 11: Statistics on Aircraft Encounters by Altitude for Hour 2

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	17.305	0.000
4000	4	20.309	7.784
5000	7	18.616	9.264
6000	7	19.543	5.786
7000	4	15.522	9.525
8000	6	18.736	3.850
9000	5	18.916	5.261
10000	4	21.641	1.661
11000	5	22.344	5.214
12000	5	19.139	11.168
13000	1	0.064	0.000
14000	3	16.082	6.814
15000	5	16.772	10.550
16000	4	9.446	5.620
17000	9	18.616	9.126
18000	11	17.361	9.171
19000	10	18.770	7.607
20000	10	21.021	7.223
21000	8	21.607	6.918
22000	7	17.778	7.400
23000	2	17.581	5.825
24000	3	17.650	7.620
25000	6	19.827	8.450
26000	3	20.923	4.349
27000	12	13.475	8.711
28000	9	21.788	6.664
29000	10	16.575	5.004
31000	22	16.510	8.188
33000	47	16.169	8.862
35000	62	17.029	8.104
37000	14	19.410	7.196
39000	6	19.221	8.356
41000	8	13.010	10.782
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	320		

Table 12: Statistics on Aircraft Encounters by Altitude for Hour 3

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	6	19.040	8.200
5000	8	16.660	6.938
6000	7	17.275	9.488
7000	5	16.216	9.859
8000	3	26.031	1.865
9000	4	17.761	3.580
10000	0	0.000	0.000
11000	1	14.864	0.000
12000	2	15.117	18.615
13000	3	17.474	10.263
14000	4	5.929	5.323
15000	4	16.616	9.518
16000	1	14.620	0.000
17000	12	17.158	6.352
18000	7	20.304	4.921
19000	5	18.967	8.958
20000	7	18.509	5.278
21000	2	21.122	7.750
22000	5	19.519	7.247
23000	3	17.998	8.573
24000	5	17.359	8.116
25000	4	11.361	6.957
26000	3	9.790	7.634
27000	4	15.457	9.391
28000	20	16.069	7.981
29000	25	15.773	7.732
31000	65	16.198	8.313
33000	72	16.061	8.225
35000	51	15.962	7.951
37000	36	19.241	8.545
39000	7	17.286	8.811
41000	3	12.261	1.754
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	384		

Table 13: Statistics on Aircraft Encounters by Altitude for Hour 4

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	1	6.381	0.000
4000	2	26.139	1.206
5000	5	14.250	12.629
6000	5	17.723	6.411
7000	3	17.331	7.356
8000	4	16.511	5.049
9000	1	9.506	0.000
10000	2	21.164	8.078
11000	0	0.000	0.000
12000	2	9.778	6.205
13000	1	22.387	0.000
14000	4	18.726	10.321
15000	1	25.917	0.000
16000	4	9.433	9.341
17000	9	17.416	8.981
18000	7	21.652	5.910
19000	3	15.171	10.769
20000	5	15.935	10.552
21000	3	11.921	3.972
22000	4	13.619	10.707
23000	2	19.495	6.806
24000	6	18.378	6.769
25000	1	22.470	0.000
26000	3	21.973	2.782
27000	6	17.444	10.829
28000	20	16.808	7.776
29000	21	16.041	7.674
31000	64	16.655	7.868
33000	67	17.676	7.433
35000	68	14.435	7.847
37000	23	15.891	7.471
39000	3	20.594	7.911
41000	11	16.797	10.806
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	361		

Table 14: Statistics on Aircraft Encounters by Altitude for Hour 5

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	0	0.000	0.000
5000	1	11.731	0.000
6000	0	0.000	0.000
7000	1	16.243	0.000
8000	0	0.000	0.000
9000	0	0.000	0.000
10000	0	0.000	0.000
11000	0	0.000	0.000
12000	0	0.000	0.000
13000	0	0.000	0.000
14000	0	0.000	0.000
15000	0	0.000	0.000
16000	1	0.934	0.000
17000	1	25.102	0.000
18000	1	5.017	0.000
19000	1	14.349	0.000
20000	0	0.000	0.000
21000	3	17.436	5.191
22000	0	0.000	0.000
23000	1	17.681	0.000
24000	1	24.767	0.000
25000	1	28.146	0.000
26000	3	5.133	3.650
27000	0	0.000	0.000
28000	3	20.479	5.319
29000	2	21.625	8.189
31000	5	20.083	4.160
33000	8	18.610	8.583
35000	2	7.504	2.391
37000	1	16.935	0.000
39000	0	0.000	0.000
41000	0	0.000	0.000
43000	0	0.000	0.000
45000	0	0.000	0.000
Total	36		